Graham M. King

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Education

Ph.D. Chemistry, March, 2010
The Ohio State University (Columbus, OH, USA)

B.S. Chemistry, February, 2005
State University of New York at Buffalo (Buffalo, NY, USA)

Research Experience

Postdoctoral Associate, Los Alamos National Laboratory April 2010-Present
Mentor: Dr. Anna Llobet

Research efforts have been mainly focused on the study of the local structures of inorganic extended solids using the pair distribution function method. Also work in the area of magnetic structure determination. Assist in the operation of the HIPD neutron diffractometer. Supervised the research of an undergraduate summer student.

Graduate Research Associate, The Ohio State University 2005-2010
Advisor: Prof. Patrick M. Woodward

Main project involved the synthesis, structural, magnetic, and electronic characterization of new perovskite compounds which have ordering on both the *A* and *B*-cation sub-lattices for potential application as multiferroic materials. Methods include X-ray and neutron powder diffraction, SQUID magnetometry, UV-Vis diffuse reflectance spectroscopy, impedance spectroscopy, and differential scanning calorimetry. Other projects involved the *ab-initio* structure determination of usually complex perovskites as well as molecular compounds from powder diffraction data. Supervised the research of three undergraduate students.

Undergraduate Research Assistant, SUNY Buffalo 2004-2005
Advisor: Prof. Philip Coppens

Projects involved crystal structure determination by single crystal X-ray diffraction, including time resolved studies of photo-induced excited state molecular geometries. Gained skills in the synthesis of coordination compounds and single crystal growth techniques.

Teaching Experience

Graduate Teaching Associate, The Ohio State University

Courses Taught: Chem 121, 122, 123, H202, H203

Taught for a total of 10 quarters. Responsibilities included supervising students during lab and conducting recitation sections. Taught for the REEL (Research Experience to Enhance Learning) program in which freshmen chemistry students complete an original research project as part of the laboratory section of their class.

Publications

22) King, G., Ramezanipour, F., Llobet, A., Greedan, J. E., **Local Structures of Sr_2FeMnO_{5+y} (y = 0, 0.5) and $Sr_2Fe_{1.5}Cr_{0.5}O_5$ from Reverse Monte Carlo Modeling of Pair Distribution Function Data and Implications for Magnetic Order.** *J. Solid State Chem.* (2013) 198, 407-415.

21) King, G., Thomas, K. J., Llobet, A., **Drastic Differences between the Local and Average Structures of $Sr_2MSbO_{5.5}$ (M = Ca, Sr, Ba) Oxygen Deficient Double Perovskites.** *Inorg. Chem.* (2012) 51, 13060-13068.

20) Ramezanipour, F., Greedan, J. E., Cranswick, L. M. D., Garlea, V. O., Siewenie J., King, G., Llobet, A., Donaberger, R. L., **The effect of the *B*-site cation and oxygen stoichiometery on the local and average crystal and magnetic structures of $Sr_2Fe_{1.9}M_{0.1}O_{5+y}$ (M = Mn, Cr, Co; y = 0, 0.5).** *J. Mater. Chem.* (2012) 22, 9522-9538.

19) Garcia-Martin, S., King, G., Nenert, G., Ritter, C., Woodward, P. M., **The Incommensurately Modulated Structures of the Perovskites $NaCeMnWO_6$ and $NaPrMnWO_6$.** *Inorg. Chem.* (2012) 51, 4007-4014.

18) Yisgedu, T. B., Huang, Z., Chen, X., Lingam, H. K., King, G., Woodward, P. M., Highley A., Maharrey, S., Behrens, R., Shore S. G., Zhao, J-C., **The Structural Characterization of $(NH_4)_2B_{10}H_{10}$ and Thermal Decomposition Studies of $(NH_4)_2B_{10}H_{10}$ and $(NH_4)_2B_{12}H_{12}$.** *Int. J. Hydrogen Energy*. (2012) 37, 4267-4273.

17) King, G., Abakumov, A. M., Woodward, P. M., Llobet, A., Tsirlin, A. A., Batuk, D., Antipov, E. V., **The High-Temperature Polymorphs of K_3AlF_6.** *Inorg. Chem.* (2011) 50, 7792-7801.

16) Dachraoui, W., Yang, T., Liu, C., King, G., Hadermann, J., Van Tendeloo, G., Llobet, A., Greenblatt, M. **Short Range Layered *A*-site Ordering in Double Perovskites $NaLaBB'O_6$ (B = Mn, Fe; B' = Nb, Ta).** *Chem. Mater.* (2011) 23, 2398-2406.

15) King, G., Ricciardo R. A., Soliz, J. R., Woodward, P. M., Llobet A. **Linking Local Structure and Properties in Perovskites Containing Equal Concentrations of Manganese and Ruthenium.** *Phys. Rev. B.* (2011) 83, 134123.

14) Garcia-Martin, S., King, G., Urones-Garrote E., Nenert, G., Woodward, P. M. **Spontaneous Superlattice Formation in the Doubly Ordered Perovskite $KLaMnWO_6$.** *Chem. Mater.* (2011) 23, 163-170.

13) Huang, Z. G., King, G., Chen, X. N., Hoy, J., Yisgedu, T., Lingam, H. K., Shore S. G., Woodward, P. M., Zhao, J. C. **A Simple and Efficient Way to Synthesize Unsolvated Sodium Octahydrotriborate.** *Inorg. Chem.* (2010) 49, 8185-8187.

12) King, G., Woodward, P. M. **Cation Ordering in Perovskites.** *J. Mater. Chem.* (2010) 20, 5785-5796.

11) King, G., Abakumov, A. M., Hadermann, J., Alekseeva, A. M., Rozova, M. G., Perkisas, T., Woodward, P. M., Van Tendeloo, G., Antipov, E. V. **Crystal Structure and Phase Transitions in Sr_3WO_6.** *Inorg. Chem.* (2010) 49, 6058-6065.

10) King, G., Garcia-Martin, S. Woodward, P. M., **Octahedral tilt twinning and compositional modulation in $NaLaMgWO_6$.** *Acta Cryst. B.* (2009) 65, 676-683.

9) Abakumov, A. M., King, G., Laurinavichute, V. K., Rozova, M. G., Woodward, P. M., Antipov, A. V., **Crystal Structure of α-K_3AlF_6: Elpasolites and Double Perovskites with Broken Corner-Sharing Connectivity of the Octahedral Framework.** *Inorg. Chem.* (2009) 48, 9336-9344.

8) King, G., Wills, A. S., Woodward, P. M. **Magnetic structures of Na*L*MnWO$_6$ perovskites (*L* = La, Nd, Tb).** *Phys. Rev. B.* (2009) 79, 224428.

7) King, G., Wayman, L. M., Woodward, P. M. **Magnetic and structural properties of Na*Ln*MnWO$_6$ and Na*Ln*MgWO$_6$ perovskites.** *J. Solid State Chem.* (2009) 182, 1319.

6) Garcia-Martin, S., Urones-Garrote E., Knapp, M. C., King, G., Woodward P. M. **Transmission Electron Microscopy Studies of NaLaMgWO$_6$: Spontaneous Formation of Compositionally Modulated Stripes.** *J. Amer. Chem. Soc.* (2008) 130, 15028-37.

5) Spirig, J. V., Routbort, J. L., Singh, D., King, G., Woodward, P. M., Dutta, P. K. **Joining of highly aluminum-doped lanthanum strontium manganese oxide with tetragonal zirconia by plastic deformation.** *Solid State Ionics* (2008) 179, 550-557.

4) King, G., Thimmaiah, S., Dwivedi, A., Woodward, P. M. **Synthesis and Characterization of New *AA′B*WO$_6$ Perovskites Exhibiting Simultaneous Ordering of *A*-Site and *B*-Site Cations.** *Chem. Mater.* (2007) 19, 6451-6458.

3) Baddeley, C., Yan, Z., King, G., Woodward, P. M., Badjic, Y. D. **Structure-Function Studies of Modular Aromatics That Form Molecular Organogels.** *J. Org. Chem*. (2007) 72, 7270-7278.

2) Kovalevsky, A.Y., King, G., Bagley, K. A., Coppens, P. **Photoinduced Oxygen Transfer and Double-Linkage Isomerism in a *cis*-(NO)(NO$_2$) Transition-Metal Complex by Photocrystallography, FT-IR Spectroscopy and DFT Calculations.** *Chem. Eur. J.* (2005) 11, 7254-7264.

1) King, G., Gembicky, M., Coppens, P. **Two novel bis(2,9-dimethyl-1,10-phenanthroline)copper(I) complexes:[Cu(dmp)$_2$]$_2$(PF$_6$)$_2$·0.5(bpmh)·CH$_3$CN and [Cu(dmp)$_2$][N(CN)$_2$].** *Acta Cryst*. (2005). C61. m329-332.

Conference Presentations

King, G., Garcia-Martin, S., Urones-Garrote, E., Nenert, G., Woodward, P. M. **Complex Superstructures Resulting from Compositional Modulation and Octahedral Tilt Twinning in *AA*'*BB*'O6 Doubly Cation Ordered Perovskites.** *Invited talk* to be given at IMAPS/ACerS 9th International Conference and Exhibition on Ceramic Interconnect and Ceramic Microsystems Technologies, Orlando, Florida, April 23-25, 2013.

King, G., Thomas, K. J., Llobet, A., **When the Average Structure is Insufficient as a Starting Model for Reverse Monte Carlo Modeling of Pair Distribution Function Data: The Case of Sr$_2$*M*SbO$_{5.5}$ (*M* = Ca, Sr, Ba) Double Perovskites.** Workshop on Advanced Simulation Techniques for Total Scattering Data, Santa Fe, New Mexico, Oct. 16-19, 2012.

King, G., Llobet, A., Ricciardo, R., Soliz, J., Woodward, P. M., Ramezanipour, F., Greedan, J., **Reverse Monte Carlo Modeling of Pair Distribution Function Data as a Tool for Separating the Coordination Environments of Multiple Atoms Disordered Over a Single Site.** American Physical Society March Meeting, Boston, Massachusetts, Feb 27 - March 2, 2012.

King, G., Abakumov, A. M., Woodward. P. M., Antipov, E. V., Llobet, A. **Non-Cooperative Octahedral Tilting in the Double Perovskites Sr$_3$WO$_6$ and K$_3$AlF$_6$.** North American Solid State Chemistry Conference, Hamilton, Ontario, Canada, June 1-4, 2011.

King, G., Abakumov, A. M., Woodward. P. M., Llobet, A. **Perovskites with Broken Corner Sharing Connectivity of the Octahedral Framework.** Materials Research Society Fall Meeting, Boston, Massachusetts, Nov. 29-Dec. 3, 2010.

King, G., Wills, A. S., Woodward, P. M. **Magnetic Structures of Na*Ln*MnWO$_6$ Perovskites (*Ln* = La, Nd, Tb).** American Crystallographic Association Annual Meeting, Toronto, Ontario, Canada, July 24-30, 2009.

King, G., Wayman, L. M., Garcia-Martin, S., Wills, A. S., Woodward, P. M., **Structural and Magnetic Properties of Perovskites with Ordering of Both the *A*-site and *B*-site Cations.** North American Solid State Chemistry Conference, Columbus, OH, June 17-20, 2009.

King, G., Wayman, L. M., Wills, A. S., Woodward, P. M., **Structural and Magnetic Properties of Perovskites with Ordering of Both the *A*-Site and *B*-Site Cations.** 41st Central Regional Meeting of the American Chemical Society, Cleveland, OH, May 20-23, 2009.

King, G., Wayman, L., Wills, A. S., Woodward, P. M., **Complex Structural and Magnetic Ordering in *AA'BB'*O$_6$ Perovskites.** Materials Research Society Fall Meeting, Boston, Massachusetts, Dec. 1-5, 2008.

King, G., Wills, A. W., Woodward, P.M. **Magnetic Structures of Na*Ln*MnWO$_6$ Perovskites with Ordering of the *A*-Site and *B*-Site Cations.** 2nd Workshop on Novel Electronic Materials, Lexington, Kentucky, May 15-17, 2008.

King, G., Woodward, P. M. **New Examples of *A*-site Cation Ordering in *AA'MW*O$_6$ Perovskites.** North American Solid State Chemistry Conference, College Station, Texas, May 17-19, 2007.

Special Skills

Structure solution of both extended and molecular solids of unusually high complexity from X-ray and neutron powder diffraction data.

Magnetism of inorganic solids, including the determination of magnetic structures from neutron powder diffraction data using representational analysis.

Local structure analysis using the pair distribution function (PDF) method. Particular specialization in large box Reverse Monte Carlo (RMC) modeling of PDF data.

Synthesis of novel inorganic compounds.

Awards and Workshops

HERCULES one month course for users of large experimental facilities	2012
Los Alamos Postdoc Research Day poster prize winner	2012
American Crystallographic Association (ACA) student travel grant	2009
International Center for Materials Research (ICMR) student travel grant (to Spain)	2008
Workshop on Representational Analysis of Complex Magnetic Structures (at NIST)	2007
Edward-Grilly Scholarship, Ohio State University	2005-2006